DEVELOPMENT AND ANALYSIS OF MECHANICAL PROPERTIES BETWEEN BANANA FIBRE AND E-GLASS FIBRE REINFORCED COMPOSITES

E Sadanandam[1], K Kasinadham[2] ,M Ravi Kumar[3]

[1]Asistant professor, Department of Mechanical Engineering, Anurag Engineering college, kodad,Telangana & Research scholar at OU.

[2]Asistant professor, Department of Mechanical Engineering, Anurag Engineering college, kodad, Telangana.

[3]Asistant professor, Department of Mechanical Engineering, Anurag Engineering college, kodad,Telangana

Abstract: In this paper mainly discussed about focuses on the banana fiber and E glass fiber which are known to be very strong and can be processed easily, As the aerial stems of the banyan tree are very strong and children in the villages used to climb the tree using the aerial stems itself the best example for its strength, and from ancient times the banyan had the good medicinal values used to cure many diseases, comparatively jute is termed as golden fiber used for making ropes , storage bags for rice , wheat etc. In the project the laminates of banana and E glass fiber composites were made with 200*200*15mm^3 volumes. The laminates are cut into the dimensions for different tests. Epoxy resin and hardener which has the excellent mechanical properties is used. Comparison between the two fibers is done and the best fiber in each stage is identified

IndexTerms – Banana fiber, E Glass fiber, Epoxy Resin.

I. INTRODUCTION

This chapter outlines some work and report available in past related to mechanical properties of natural fiber based polymer composites with unique consideration on banana fiber based polymer composites. The mechanical behavior of a natural fiber based polymer composite depends on numerous factors, for example, fiber length and quality, matrix, fiber-matrix adhesion bond quality and so forth. The strong interface bond between fiber and matrix is paramount to show signs of improvement mechanical properties of composites. We have studied the effect surface treatment on the chemical properties of banana fiber and reported that treated banana fiber give higher shear interfacial stress and tensile strength when compared with the untreated fiber. have studied about the surface and sub-surface degradation of unidirectional carbon fiber and have given many conclusion such as under sliding in dematerialized water, the most simple degradation was detected on sliding in anti-parallel direction. Shankar et al. [8] have studied and reported that the ultimate tensile strength value maximum at 15% and then decreases with increasing in fiber starting from 15% to 20%. They also reported that the flexural strength value decreasing from 5% to 10% (87.31 MPa) and after that the value increased from fiber. we have investigated the influence of fiber length on the mechanical and physical properties of nonwoven short banana, random oriented fiber and epoxy composite and they described that the tensile properties and percentage elongation of the composite attained a maximum in composite fabricated from 15 mm fiber length. They have also reported that the impact energy whereas the compressive strength increases decreased with increasing fiber length, also the mean flexural properties of the composite increased with increasing in fiber length up to 25mm. The banana fibers characteristic depending on the variation of diameter, mechanical characteristic and the effects of the stresses performing on the fracture morphology. The banana and glass fiber bio-composites may be fabricate for outdoors and indoors applications wherever high strength is not necessary, additionally it can considered as the replacement to wood materials and protect the forest resources. We have studied the mechanical properties of banana fiber based epoxy composite and it was observed that the tensile strength is increased by 90% of the pseudo-stem banana fiber reinforced epoxy composite associated to virgin epoxy. In his results the impact strength of pseudo-stem banana fiber improved by approximately 40% compare to the impact strength of neat epoxy.

II. MATERIALS AND METHODS

The banana fiber (Figure 1.1) is obtained from banana plant, which has been collected from local sources. The extracted banana fiber were subsequently sun dried for eight hours then dried in oven for 24 hours at 105° C to remove free water present in the fiber. The dried fiber were subsequently cut into lengths of 5, 10, 15 mm. The epoxy resins and hardener are procured from Ciba Geigy India Ltd. The banana fiber based epoxy composite is fabricated using hand lay-up process. The moulds have been prepared with dimensions of 180×180×40 mm3. The banana fiber of different length has been mixed with matrix mixture with their respective values by simple mechanical stirring and mixture are slowly poured in different moulds, keeping the characterization standards and view on testing condition. The releasing agent has been use on mould sheet which give easy to composites removal from the mould after curing the composites. Glass fiber-reinforced polymeric composites were most commonly used in the manufacture of composite materials. The matrix comprised organic, polyester, Thermo stable, vinylester, phenolic and epoxy resins. Polyester resins are classified into bisphenolic and ortho or isophtalic. The mechanical behaviour of a fiber-reinforced composite basically depends on the fiber strength and modulus, the chemical stability,matrix strength and the interface bonding between the fiber/matrix to enable stress transfer.4 Suitable compositions and orientation of fibers made desired properties and functional characteristics of GFRP composites was equal to steel, had higher stiffness than aluminum and the specific gravity was one-quarter of the steel. The various GF reinforcements like long longitudinal, woven mat, chopped fiber (distinct) and chopped matin the composites have been produced to enhance the mechanical and tribological properties of the composites. The properties of composites depend on the fibers laid or laminated in the matrix during the compositespreparation.6 High cost of polymers was a limiting factor in their use for commercial applications. Due to that the use of fillers improved the properties of composites and ulitimately reduced the cost of the preparation and product.

Banana Fibre E Glass Fibre Epoxy resin Hardener & Accelerator

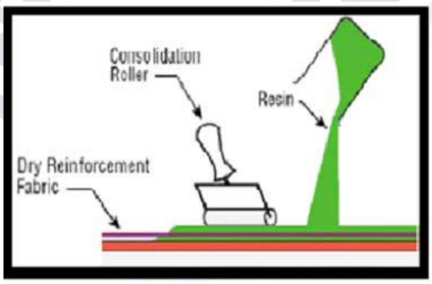
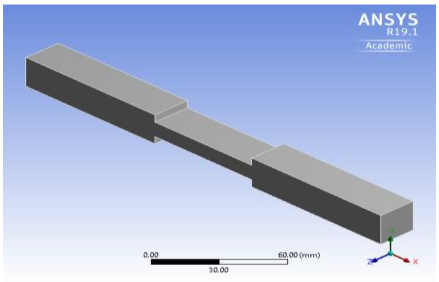


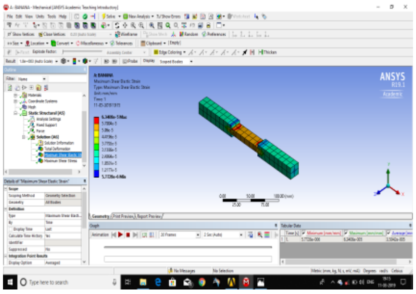
Fig.1.1.Raw materials and manufacturing procedure of Specimens

III.RESULTS AND DISCUSSION:

ANALYSIS ON BANANA FIBER wiTh ANSYS:

First Saved	Tuesday, March 5, 2019
Last Saved	Tuesday, March 5, 2019
Product Version	19.1 Release
Save Project Before Solution	No
Save Project After Solution	No





BANANA > Strain-Life Parameters

Strength Coefficient MPa	Strength Exponent	Ductility Coefficient	Ductility Exponent	Cyclic Strength Coefficient MPa	Cyclic Strain Hardening Exponent
920	-0.106	0.213	-0.47	1000	0.2

TABLE 1

BANANA > Isotropic Elasticity

Young's Modulus MPa	Poisson's Ratio	Bulk Modulus MPa	Shear Modulus MPa	Temperature C
2.e+005	0.3	1.6667e+005	76923	

TABLE 2

BANANA > Isotropic Relative Permeability

Relative Permeability
10000

TABLE 3

E GLASS:

TABLE 4

E Glass > Constants

Density	7.85e-006 kg mm^-3
Isotropic Secant Coefficient of Thermal Expansion	1.2e-005 C^-1
Specific Heat Constant Pressure	4.34e+005 mJ kg^-1 C^-1
Isotropic Thermal Conductivity	6.05e-002 W mm^-1 C^-1
Isotropic Resistivity	1.7e-004 ohm mm

TABLE 5

E Glass > Color

Red	Green	Blue
132	139	179

TABLE 6

E Glass > Compressive Ultimate Strength

Compressive Ultimate Strength MPa
0

TABLE 7

E Glass > Compressive Yield Strength

Compressive Yield Strength MPa
250

TABLE 08
E Glass > Tensile Yield Strength

Tensile Yield Strength MPa
250

TABLE 09
E Glass > Tensile Ultimate Strength

Tensile Ultimate Strength MPa
460

TABLE 10
E Glass > Isotropic Secant Coefficient of Thermal Expansion

Zero-Thermal-Strain Reference Temperature C
22

CONCLUSION

Based on the test results it's clear that impact strength of banana fibre composite is more than the E Glass fibre composite, tensile stress for E Glass fibre composite is more than the banana fibre composite , flexural stress for both the banana and E Glass fibre composite were same, water absorption for banana fibre composite is more than that of E Glass fibre composite. While ANSYS analysis it is known that the total deformation is more to E Glass fibre compared to banana fibre, the max shear stress is more for E Glass fibre than compared to banana fibre, max shear elastic strain is more for E Glass fibre compared to banana fibre. So, here by declare that both the fibres are competing each other for different mechanical properties, by combining these two fibres there is a possibility for making a different composite which there by gets both the fibre properties. The present project gives the scope for further combining of these two fibres and making a new composite.

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